

mined for each vapor at ordinary temperature, is: water 1.9×10^{-11} , ethyl alcohol 2.5×10^{-11} , benzene 0.8×10^{-11} per cent of the total vapor molecules present, which would correspond to about 100,000,340,000,190,000 molecules per cu. cm. These nonelectric molecules are characteristic for each vapor. Exposure of the vapor-gas mixtures to β and γ radiations, further increases the size of the nuclei, and thus the numbers of molecules per nucleus, to 8 for water and 6 for alcohol; and increases also in particular their number very much, in accordance with the radiation intensity. Lenard's theory supplements Kelvin's theory by adding a term depending on the ratio of the portion of the drop surface from which evaporation can take place, and on the surface tension which varies with the radius and the thickness of the liquid shell. It also differs from J. J. Thomson's theory in so far as with increasing expansion a supersaturation is said to be reached at which all the nuclei are condensed; the total number of nuclei in water vapor (no external field) seems to be limited to 10^5 , as stated.—H. B[orns].

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A NEW EVAPORATION FORMULA.¹

By R. E. HORTON.

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In 1802 Dalton deduced the formula $E = C(V - v)$, where E is the rate of evaporation from a liquid surface, V the vapor pressure corresponding with the temperature of the liquid, v the vapor pressure existing in the atmosphere at the time and C is a constant. The effect of the wind was allowed for by varying the value of C . Later workers have usually introduced a factor of the form $(1 + kw)$ to allow for the wind speed w . According to the formula thus modified, the rate of evaporation increases indefinitely with increase of wind, whereas in practice a maximum value is obtained when the wind velocity reaches 15 to 20 miles an hour, and above this there is no further increase. The author, therefore, prefers to allow for wind by the introduction of an exponential factor, and deduces the equation,

$$E = C[(2 - e^{-kw})V - v].$$

Values of the coefficient $(2 - e^{-kw})$ may be read off from a graph thus simplifying the working. The formula is also applicable to the case of condensation. It will be seen that under certain conditions of temperature and humidity condensation will take place in still air, while there will be slight evaporation under the same conditions in a wind. This result has been verified in practice. The formula as stated applies to a small liquid surface. The latter part of the paper is devoted to a consideration of the case of a larger area where the evaporation from the leeward part will be hindered by the presence of the vapor given off by the part more to windward. The author states that it will, in many cases, be more accurate to calculate the rate of evaporation from a large water surface by means of the formulæ here put forward, than to rely on attempts at direct measurement with the ordinary type of evaporimeter.—J. S. Di[nes].

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FORESTS-AND-RAINFALL EXPERIMENTS.

There appeared in *Nature*, for August 2, 1917 (pp. 445-446), a review by Mr. Hugh R. Mill, of the recent

Indian Forest Bulletin No. 33 by M. Hill, chief commissioner of forests of the Central Provinces. Dr. Gilbert Walker of the Indian Meteorological Department contributed two appendices to that bulletin, and concerning Dr. Walker's conclusions Mr. Mill says in part:

Dr. Walker considers that, as Blandford pointed out in 1887, "the only satisfactory evidence would be that obtained by comparing the rainfall of a district when well supplied with forests with that of the same district when the trees were very few." In our opinion the comparison should not be that of a district A at the time t with the same district at the time t' ; but to compare the relation of district A to a contiguous district B at the time t with the relation of A to B at time t' , where A is a district that has undergone a great change as regards forest covering, while B has remained unchanged. The reason for this indirect comparison is, of course, to eliminate the effect of the two periods falling in what Prof. H. H. Turner calls different climatic chapters. Another method would be to determine the relation of the isohyetal lines to the configuration of the land on wooded and treeless districts of similar character. As pointed out in the report on the rainfall in the Geological Survey's "Water Supply Memoirs of Hampshire," the district of the New Forest shows a considerably higher general rainfall than its elevation above sea level appears to suggest. The subject is both fascinating and important, and the time will no doubt come when increase of accurate observations will enable the vague belief in the beneficial influence of forests on climate to be supported or corrected by definite meteorological evidence.

It seems appropriate here to recall the circumstance that precisely the first method here suggested by Mr. Mill for solving the problem of the relations between rainfall and forestation was adopted by the United States Weather Bureau in 1910, cooperating with the United States Forest Service. These two services have selected two contiguous and practically identical watersheds in the Rio Grande National Forest (lat. $37^{\circ} 45' N.$, long. $106^{\circ} 50' W.$, alt. 9,400-11,000 feet) near Wagon Wheel Gap station on the Denver & Rio Grande Railroad, at present under identical forested conditions, and have established therein a large number of thermometer, precipitation, and stream-gage stations. Careful observations will be carried on in both watersheds for a number of years¹ and at the conclusion of this first period one of the watersheds will be deforested and the same observations continued for a second period corresponding to the first one.

Already we have secured nearly a full 6-years' record there, as observations actually began October 22, 1910. While the United States seems to have been the first to take this step, it is certainly desirable that as many other countries as possible should make the same test.

Concerning the second method suggested by Mr. Mill, it is not likely that any area in the United States is sufficiently supplied with well-distributed raingages to encourage one in undertaking the computational labor involved.—C. A., jr.

EXCESSIVE PRECIPITATION IN LONDON, ENGLAND.

[Reprinted from *Nature*, London, June 21, 1917, 99:328.]

Dr. H. R. Mill records, in the *London Times* of June 19, 1917, that the thunderstorm between 5 and 7 p. m. (summer time)² on Saturday, June 16, was, if measured by rainfall, one of the most severe ever experienced in London. More than 2 inches fell over an area measuring 10 miles from Barnes to Finsbury Park and 4 miles from Hyde Park to Willesden Green. At two points within this area more than 3 inches was reported—viz,

¹ The experiment is described in detail in the MONTHLY WEATHER REVIEW, September, 1910, 38:1453-1455, with map.

² "Summer Time." This is the first reference in the MONTHLY WEATHER REVIEW to the "daylight saving" scheme that has been in such general use among European countries since 1916. "Summer time" in England is 1 hour faster than Greenwich Mean Time. A presentation of the advantages and disadvantages of "Summer Time", as developed by a year of actual experience therewith, will be found in Review of Reviews, New York, June, 1916, pp. 715-716.—C. A., jr.

¹ Engineering News-Record, New York, Apr. 26, 1917, 78:196-199.